NASA STTR 2004 Phase I Solicitation

T3 Glenn Research Center

The NASA Glenn Research Center at Lewis Field, in partnership with other NASA Centers, U.S. industries, universities, and other Government institutions, develops critical technologies that address National priorities for space and aeronautics applications. Our world-class research and technology development is focused on space power, space flight, electric and nuclear space propulsion, space and aeronautic communications, advanced materials research, biological and physical microgravity science, and aerospace propulsion systems for safe and environmentally friendly skies. One-third of our program responsibilities are in space and microgravity, one-third in space exploration systems, and one-third in aeronautics. We support NASA's commitment to safely return the shuttle to flight through ballistic impact testing, rudder speed brake actuator analysis, on-orbit repair of the wing leading edge research, aging analysis, and wind tunnel tests of the external tank.

NASA Glenn has two sites in northern Ohio. Situated on 350 acres of land adjacent to the Cleveland Hopkins International Airport, the Cleveland site in northeast Ohio comprises more than 140 buildings including 24 major research facilities and over 500 specialized research and test facilities. Plum Brook Station is 50 miles west of Cleveland hand has four large, major world-class facilities for space research available for Government and industry programs. The staff consists of over 3200 civil service and support service contractor employees. Scientists and engineers comprise more than half of our workforce, with technical specialists, skilled workers, and administrative staff supporting them. Over 60 percent of our scientists and engineers have advanced degrees, and 25 percent have earned PhD degrees.

Subtopics

T3.01 Aeropropulsion and Power

Lead Center: GRC

The research sponsored by the Propulsion and Power Project focuses on ensuring the long-term environmental compatibility and efficiency of aircraft propulsion and power systems. The project addresses critical propulsion and power technology needs across a broad range of investment areas including revolutionary advances in combustion-based aeropropulsion systems and technologies and unconventional propulsion and power systems and technologies. High-risk, high-potential research investments include fuel-cell based propulsion systems, high-temperature nanotechnology, and pulse detonation engine components and subsystems. Ultimately, the Propulsion and Power Project seeks to demonstrate (in a laboratory environment) key component technologies to enable nonconventional combustion-based propulsion systems and electric and hybrid propulsion and power systems. The

Propulsion and Power Project directly supports the NASA objectives of: "Protect the Environment–Protect local environmental quality and the global climate by reducing aircraft noise and emissions" and "Explore New Aerospace Missions–Pioneer novel aerospace concepts to support Earth and space science missions."

Innovations sought include:

- Alternative fuels and/or alternative propulsion systems, i.e., aeronautical propulsion technology concepts with horizons of 20–40 years from today with potential for two times the payload-range performance. Such high-payoff propulsion systems would set new, revolutionary directions well beyond the evolutionary approaches. These alternative fuel and/or alternative propulsion systems may include, but are not limited to the following areas.
    - Revolutionary engine design (technologies beyond the conventional Brayton cycle gas turbine engine). For example, micromachined SiC microengines which may have potential for use in a distributed propulsion architecture.
    - Nano- and autonomous systems. For example: nanotechnology fibers, tubes, spheres, and high temperature shape memory alloys and piezoelectric materials for their unique role in tribology, structures and composite reinforcements, and control systems for autonomous, adaptive engine control and sealing.
- Non-combustion (electric) propulsion and power systems, e.g., hydrogen-based and electric aeropropulsion (propulsion systems capable of flight while producing zero CO_2 emissions), and new missions enabled by quiet, clean, electric propulsion. Key technologies to enable design of an alternatively fueled, fuel cell or hybrid propulsion system. These technologies may include, but are not limited to:
    - Hydrogen tankage;
    - Fuel cell systems, components, and subcomponents; and
    - Power management and distribution materials, components, and configurations.